



## A COMPARATIVE STUDY OF INTUBATING CONDITIONS AFTER USING ROCURONIUM AND SUXAMETHONIUM

### Anaesthesiology

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### ABSTRACT

**Objective:** To compare the Intubating Conditions and Changes in heart rate (HR) achieved after Suxamethonium Chloride and Rocuronium Bromide, during intubation, in patients between ages 11-50 years out of which 4 were in paediatric age group(11-12 years ) and 46 in adult age group(19-50years).

**Material and Method:** Fifty patients aged between 11-50 years, 4 including in paediatric age group(11-12 years) and 46 in adult age group(19-50 years), requiring general anaesthesia for various surgical procedures, were randomly divided in to two groups, i.e. Group A in which Rocuronium bromide, 0.9 mg kg-1 was given for intubation {(n=25) (23 adults, 2 children)} Group B in which Suxamethonium chloride 1.5 mg kg -1 was used for intubation {(n=25) (23 adults, 2 children)} Intubating conditions were observed at 60 seconds after intravenous bolus administration of suxamethonium or Rocuronium. HR was also observed immediately before induction (Pre- Op), at 60 seconds after bolus of Suxamethonium or Rocuronium (Immediately after relaxation), Immediately after intubation and then five minutes after intubation.

**Results:** Intubating conditions were rated as excellent in 96% (n=24 Twenty two adults two children) and good in 4% (n=1 Adult) of the patients who received Rocuronium and excellent in 100% of the patients who received Suxamethonium. There were no statistically significant changes observed in HR at all observation times between the two groups.

**Conclusion:** It is concluded from this study that intubation can be performed under good to excellent conditions at 60 seconds after a bolus dose of Rocuronium of 0.9 mg kg-1. As far as affect on HR are concerned, our study indicate no significant difference between the two drugs. The result of this study indicates that to facilitate intubation using rapid sequence induction technique Rocuronium is a reasonably good alternative to Suxamethonium.

### KEYWORDS

Intubating Conditions, heart rate (HR), Rocuronium, Suxamethonium.

### INTRODUCTION

Maintenance of a patent airway is a basic and essential component of general anaesthesia (GA), regardless of the technique selected. Endotracheal intubation is one of the available means of doing so in day to day practice. Muscle relaxants are useful in providing adequate relaxation and enable laryngoscopy and intubation. Suxamethonium, a depolarizing muscle relaxant with its rapid onset and short duration of action is still a relaxant of choice to facilitate endotracheal intubation. In addition to fasciculation, Suxamethonium has got many side effects such as bradycardia and other dysrhythmias, rise in serum potassium, post-operative myalgia, and rise in intraocular, intragastric and intracranial pressure, incidences of prolonged recovery in patients with pseudo-cholinesterase deficiency and triggering of malignant hyperthermia.

Because most of the side effects of Suxamethonium reflect its depolarizing mechanism of action therefore research is still going on for an ideal neuromuscular blocking agent focused on non-depolarizing type of relaxant, which has rapid onset time and offers good to excellent intubating conditions, as rapidly as Suxamethonium and which lacks the above mentioned adverse effects<sup>(1-4)</sup>. Rocuronium bromide a newer amino-steroidal compound is a derivative of Vecuronium.<sup>(5-6)</sup> Rocuronium has a rapid onset time, an intermediate duration of action and rapid recovery with cardiovascular stability. Keeping these properties in mind it was decided to study two important properties i.e.

- 1: Intubating conditions. and
- 2: Changes in HR after Suxamethonium, a time tested popular short acting depolarizing neuromuscular blocking agent and Rocuronium, recently introduced intermediate acting non depolarizing neuromuscular blocking agent, with Propofol as the sole induction agent in elective, otherwise healthy adult population.

### Material and Method:

The study was conducted at NIMS Jaipur, after obtained the permission from research and ethics committee of the hospital, informed consent was taken from Fifty patients aged between 11-50 years, out of which 4 were in paediatric age group and 46 in adult age group. They required general anaesthesia for various surgical

procedures, and were having ASA physical status I or II and Mallampatti grade I or II. They were randomly divided into two groups, i.e.

Group A in which Rocuronium bromide, 0.9 mg kg-1 was given for intubation.

Group B in which Suxamethonium chloride 1.5 mg kg -1 was used for intubation.

### Inclusion Criteria:

All patients were healthy, no other systemic or metabolic disorder. All patients advised various surgical procedures like laparoscopic surgery, ENT, thyroid surgery, Hernia repair, hysterectomy dental procedure with expected time of surgery of less than two hours and free of any metabolic disorders.

Patients were excluded if they were known to have neuromuscular disease or were receiving medications known to influence neuromuscular function, and patients scheduled for caesarean section and emergency surgeries were more.

Pre operative all patients were examined thoroughly and a detailed history noted. Systemic examination of respiratory system, cardiovascular system, alimentary system, central and peripheral nervous system were carried out to rule out any pathological condition. Patients vital data e.g. temperature, pulse rate blood pressure and respiratory rate were noted. Routine investigations were done in all cases. A written informed consent was taken from all patients who were found suitable for the study, explaining them the broad outline of the study and procedure. All patients were kept nil by mouth for at least 8 hrs on the day before surgery. Upon arrival in operation theatre peripheral venous line was secured. Patients were monitored with Pulse Oximeter, ECG monitor, NIBP monitor, Capnography. Vital data like pulse rate, blood pressure, SPO2 were recorded. All patients were given premedication with Injection Fentanyl 1 mcg/kg, 5 min before induction of anaesthesia and again pulse, blood pressure, SPO2, ECG were noted as pre-induction data. A number tag was attached with each patients arm who were participating in the study by the nurse in reception area who was blinded to the study.

Intraoperative Management: HR of all patients (n=25) was recorded from an ECG monitor before starting pre-oxygenation (Pre OP reading) and then patients were pre-oxygenated with 100% O2 with face, induction of anaesthesia was done according to a predetermined random number table provided to each anaesthesiologist participating in the study.

Group A: Anaesthesia was induced with inj. Propofol 2 mg kg-1 IV followed by inj. Rocuronium bromide 0.9 mg kg-1 IV given over 10 seconds

Group B: Anaesthesia was induced with inj. Propofol 2 mg kg-1 IV followed by inj. Suxamethonium 1.5 mg kg-1 given over 10 seconds.

Time was noted at the end of Suxamethonium or Rocuronium administration. The patients were ventilated with 100% oxygen with intermittent positive pressure ventilation on face mask. HR was observed and recorded from an ECG monitor at this time Immediately after relaxation reading. In both groups atraumatic laryngoscopy was tried after 60 seconds of I/V bolus administration of either Suxamethonium or Rocuronium. Intubating conditions were observed as given below in (Parameters Observed) and graded according to Cooper's intubation scoring system. Patients were intubated with proper sized endotracheal tube and HR was noted immediately after intubation and Five minutes after intubation. Anesthesia proceeded with O2, N2O, Isoflurane and further doses of muscle relaxant as required with use of closed circuit and circle absorber and controlled ventilation with a ventilator. Other vital signs parameters like ECG, NIBP and SPO2 were continuously observed throughout the operation. At the completion of surgery, reversal of neuromuscular blockade was achieved with injection Neostigmine 0.05 mg kg-1 and Injection Atropine 0.02 mg kg-1 intravenously. After satisfactory recovery, patients were extubated. Post operatively all vital data e.g. pulse, blood pressure, respiratory rate were monitored. Also patients were observed for nausea, vomiting, bradycardia, tachycardia, hypotension, respiratory obstruction.

Parameters Observed: Intubating conditions were assessed using cooper's intubation scoring system (Table 1)

The appropriate values were selected and added up to a total numeric score of a maximum of 9.

A total score of  
 8-9=excellent  
 6-7=good  
 3-5=Fair and  
 0-2 is rated as poor intubating conditions.

Good and excellent intubating conditions were taken to be "clinical acceptable" by Cooper et al. (Table-1)

**Table 1: Cooper's intubation scoring system**

Score	Jaw Relaxation	Vocal cords	Response to Intubation
0	Poor	Closing	Severe coughing/bucking
1	Nominal	Closing	Mild cough
2	Moderate	Moving	Slight diaphragmatic movement
3	Good	Open	None

HR was observed Pre Operatively, Immediately after relaxation, Immediately after Intubation and Five Minutes after intubation as described above in intra-op management.

Statistical Analysis: Data was analysed using SPSS version 15. Descriptive statistics were used to describe the data. To check the significance of difference chi square test was applied. Categorical variables and independent sample 't' test was applied for numeric variables. P-value<0.05 was taken as significant.

**Results**

The two groups were similar in epidemiological characteristics like mean age and sex (Table-2),

**Table-2: Epidemiological Data for Both Groups**

GROUP	Total Number	Adults (ages 19-50)	Children(Age s11-12)	Males	Females	Mean Age+/- SD
GROUP-A	25	23	2	17	8	27.98+/-SD 8.25
GROUP-B	25	23	2	20	5	28.12+/-SD7.36

duration of surgery and the type of surgery they underwent. Intubating conditions were rated as excellent in 96 % (n=24). Twenty two adults

two children) and good in 4% (n=1 Adult) of the patients who received Rocuronium and excellent in 100% (n=25, 23 adults and 2 children) of the patients who received Suxamethonium (Table-3)

**Table-3: Intubating Conditions in (Group- A) and (Group- B)**

Intubating Condition	Group- A No. of Patients (%)	Group- B No. of Patients (%)
Excellent	24(96%Adults=22 and children=2)	25(100% Adults=23 and children=2)
Good	01(4%Adult=1)	00
Poor	00	00
Inadequate	00	00

P-value >0.05

Changes in HR are shown in table 4.

**Table-4: Changes in Mean Heart Rate in (Group- A) and (Group- B)**

Time	Group A		Group B		t	df	P value
	Mean+/-SD	Difference from Pre-op. %	Mean+/-SD	Difference from Pre-op. %			
Immediately After relaxation	94.16+/-17.385	5.87	94.52+/-11.417	3.27	0.079	24	>.05
Immediately after Intubation	106.84+/-17.960	6.79	107.24+/-12.726	7.19	0.083	24	>.05
5 min	99.20+/-16.785	0.83	97.40+/-12.858	2.6	0.079	24	>.05

Mean Pre-op HR in Group A was (100.04 +/- SD15.24) and in Group B it was (97.72 +/- SD12.26). Mean HR Immediately after relaxation in Group A was (94.16 +/- SD17.38) and in group B it was (94.52 +/- SD11.41) and this is not a significant difference when compared with pre-op values (P>.05). Similarly there was no statistically significant difference from pre-OP reading between two groups Immediately after intubation and 5 minutes after intubation.

**Discussion**

An ideal muscle relaxant should have non-depolarizing mechanism of action with rapid onset, short duration of action and rapid recovery. It should be non-cumulative, having no histamine release and no cardiovascular side effects, with high potency, and prompt reversibility by cholinesterase inhibitors and pharmacologically inactive metabolites<sup>(7,8)</sup>.

Suxamethonium, a depolarizing muscle relaxant with its rapid onset and short duration of action is still relaxant of choice to facilitate tracheal intubation. In addition to fasciculation, Suxamethonium has got many side effects such as bradycardia and other dysrhythmias, rise in serum potassium, post operative myalgia, rise in intraocular, intragastric and intracranial pressure, incidences of prolonged recovery in patients with pseudo-cholinesterase deficiency and triggering of malignant hyperthermia.

Because most of the side effects of Suxamethonium reflect its depolarizing mechanism of action therefore search for an ideal neuromuscular blocking agent focused on non-depolarizing type of relaxants which has rapid onset time and offer good to excellent intubation conditions, as rapidly as Suxamethonium and which lacks the above mentioned adverse effects. Rocuronium, a new non-depolarizing amino steroidal muscle relaxant is chemically 2-morpholino, 3-desacetyl, 16-N-allyl pyrrolidino derivative of Vecuronium, differing from it at 3 positions on steroid nucleus. The present study compares intubating conditions and onset time of Rocuronium and Suxamethonium. Intubating conditions can be influenced by the choice of the anaesthetic agent and the use of adjuvant drugs such as narcotics, sedatives or lidocaine. In the present study no sedatives were administered in the pre-operative period to maintain the clarity of assessment. Fentanyl was used as an analgesic in a dose of 1 mcg/kg in both groups.

In most studies, an appropriate timing of tracheal intubation has been determined by 3 ways

1. Clinical judgment
2. Neuromuscular monitoring either by twitch Suppression (maximum blockade) or TOF ratio
3. Predetermined time after the administration of Neuromuscular blocking agent e.g. 60 seconds or 90 seconds.

Patients in our study were similar in both groups as far as epidemiological characters, duration of surgery and type of surgery they underwent. We have relied on predetermined time for tracheal intubation. Results of present study, regarding intubating conditions are summarized in table-3 showing total intubating score achieved and the frequency distribution of excellent, good, fair and poor conditions achieved after the administration of either Rocuronium 0.9 mgkg-1 or Suxamethonium 1.5 mgkg-1 following routine induction for elective

operations. Taking together those patients with 'excellent' and 'good' intubating condition, pooled data of our study shows that there is not any significant difference ( $P > 0.05$ ) in the frequency distribution of clinically acceptable intubating conditions, after the administration of Suxamethonium and Rocuronium. The clinically acceptable conditions are present in all the patients of the two groups receiving Rocuronium and Suxamethonium.

We also recorded heart rate Pre-operatively, Immediately after relaxation before intubation, Immediately after intubation and Five minutes after intubation, Then calculated change in HR from Pre-Op value in both groups at all these times and compared this change among the two groups and found that there is statistically no significant difference in this change from pre op value ( $P > 0.05$ ) among the two groups.

The result of this study supported the contention that 0.9 mg/kg-1 of Rocuronium might be a suitable alternative to 1.5 mg/kg-1 of Suxamethonium for rapid endotracheal intubation in 60 Sec in elective cases. Apparently, Rocuronium was not fully interchangeable with Suxamethonium, as demonstrated by the uniformly excellent intubating conditions after the administration of Suxamethonium (100%) but not with Rocuronium (96%) but clinically both provide acceptable intubating conditions (Good+Excellent=100%).

### Conclusion

It is concluded from this study that intubation can be performed under good to excellent conditions at 60 seconds after a bolus dose of Rocuronium of 0.9 mg/kg-1, and there is no significant difference between two drugs regarding affect on Heart rate. Rocuronium might be a suitable alternative to Suxamethonium 1.5mg/kg-1 for rapid endotracheal intubation in 60 Sec, in elective cases if side effects of suxamethonium are to be avoided.

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